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MAELIA-OWM: agro-environmental and socio-economic modelling and assessment tool for territorial management of organic resources

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Abstract: The use of organic wastes (OW) as fertilizers has various positive effects on ecosystem services such as soil fertility, climate regulation and soil biodiversity. OW use can also have negative effects such as increased nitrogen leaching and heavy metals accumulation. Moreover, OW can affect different aspects of a farming system (workload, yields, fertilizing costs). Optimizing OW management at local level requires an approach that would consider their characteristics (e.g. organic matter stability, fertilizing value), climate, soil and cropping system heterogeneities as well as the multiple feedback relationships that link the system components. OW territorial management could benefit from an Integrated Assessment and Modelling (IAM) tool allowing stakeholders to consider biophysical and socio-economic processes from field to territorial level. To reach this objective, we adapted the IAM MAELIA platform developed for modelling and simulating social-agro-ecosystems at local/regional level. MAELIA-OWM (Organic Wastes Management) provides solutions for assessing ecosystem services, economic and social impacts of scenarios regarding territorial OWM, agricultural activities, agro-environmental policies and climate changes. MAELIA is based on a set of validated models suitable for the simulation of various biophysical contexts. MAELIA-OWM is applied on the Versailles Plain, France (240 km²). This territory is characterized by a high availability but low usage of urban OW. MAELIA-OWM requires multiple sets of spatial data describing the territorial settings (e.g. climate grid, soil map, Land Parcel Identification System) and the agricultural practices of the study area. Different prospective scenarios (greater use of available OW, cover cropping) were compared to a baseline scenario (little use of OW, current practices) through a set of agro-environmental and socio-economic criteria (GHG emissions, carbon storage, nitrogen leaching, gross margins and workload). Actual developments of the model are dedicated to the implementation of an OW-chain model that will consider organic wastes production, transformation and transport.

***Keywords**:* Organic wastes; social-agrosystem; spatial simulation; integrated assessment and modelling